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THE EFFECT OF DIVIDENDS AND EARNINGS ON STOCK PRICES

by

© Hugo Idler

A THESIS

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled The Effect of Dividends and Earnings on Stock Prices, submitted by Hugo Idler, in partial fulfillment of the requirements for the degree of Master of Business Administration.

ABSTRACT OF THE THESIS

This study attempted to find empirical evidence relative to the dividends-earnings controversy of stock valuation. The main objectives of the thesis were (1) to determine the relative weights which investors place on dividends and earnings in stock valuation, and (2) to determine if these relative weights vary among industries and over time. In order to attain these objectives price, earnings, and dividends data were obtained for the years 1956 to 1967 for three Canadian industries, namely, the printing and publishing industry, the gas distribution industry, and the utilities industry. The study also included a group of firms selected on the basis of rapid price appreciation. The data were then subjected to both time-series and cross-section multiple regression.

In using the time-series and the cross-section models, the problems of autocorrelation and multicollinearity were encountered and given special consideration. The problem of autocorrelation was solved by subjecting the pertinent data to a mathematical transformation which produces the desired random dispersion of the residuals. The problem of multicollinearity was less severe in the cross-section model and for this reason, the analysis of results was based largely on the cross-section results.

The results of the study lead to the conclusion that investors consider both earnings and dividends important in stock valuation and that the relative importance of these variables vary among industries and over time. It appeared that the growth characteristics of an industry determine to a large extent whether earnings or dividends are more important in stock valuation.

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CHAPTER I

INTRODUCTION

The neoclassical theory of valuation of the firm suggests that the objective of a firm is to maximize its value. The value of a firm is measured in terms of the market price of its common stock. Investors determine the value of a share of common stock on the basis of future income that it will provide. This income takes the form of future dividends per share plus the difference between the buying price and the selling price at the end of a given period of time.

Investors' dividend expectation is influenced by a corporation's current income, its retention and investment rate, and its rate of return on additional investment. If the corporation engages no outside financing, its retention and investment rate are equal. Of the three variables mentioned, the only one a corporation can control to directly influence the price of its stock is its retention rate, that is, its dividend payout rate. The question then arises whether the return to stockholders is greater if the firm has a high dividend payout or if it has a low dividend payout rate.

Theoretically, the optimum dividend payout will depend directly on the relative size of the firm's rate of return on additional investment and the cost of capital. If a firm's rate of return is greater than the cost of capital, then it is beneficial to the stockholder for the firm to reinvest its earnings rather than pay them out in the form of dividends. If a firm's rate of return on additional investment is smaller than the cost of capital, then the return to the stockholder is greater if the firm pays out its earnings in the form of dividends. In practice, the optimum

dividend payout rate will depend on the relative weights investors place on earnings and dividends when valuing a share of stock.

The question of whether earnings or dividends are a more significant determinant of stock price has been the subject of a great deal of controversy in the last fifteen years. F. Modigliani and M.H. Miller[1] suggest that the value of a firm's stock is independent of the firm's dividend policy. M. Gordon[2] contends that stock prices are not independent of dividend policy.

In an attempt to find empirical evidence relative to the controversy, this study has adopted the following objectives:

(1) to determine the relative weights which investors place on earnings and dividends in stock valuation,

(2) to determine if these relative weights vary among industries and over time.

In order to achieve these objectives, four Canadian industries have been selected and subjected to multiple regression. Both time-series and cross-section models were employed. For the time-series regressions, industry indexes were calculated for price, earnings, and dividends and were subjected to multiple regression for the period from 1956 to 1967. For the cross-section regressions, price, earnings,

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1. Franco Modigliani and Merton H. Miller, "Dividend Policy, Growth, and the Valuation of Shares," Journal of Business, XXXIV, No. 4 (October, 1961).

2. M.J. Gordon, "Dividends, Earnings, and Stock Prices," The Review of Economics and Statistics, XLI, No. 2, part 1 (May, 1959).

and dividend data of the individual firms in an industry were subjected to multiple regression for the base years 1956 to 1967. The cross-section model was employed to determine whether the relative importance of earnings and dividends varied from year to year and also to complement the time-series regression results. By studying twelve base years in succession, significant trends could be observed regarding the relative influence of earnings and dividends on stock prices.

Problems of autocorrelation and multicollinearity are encountered throughout the study and are given special consideration. A statistical technique is employed to adjust for autocorrelation wherever this problem occurs. The problem of multicollinearity is less severe in the cross-section regressions than in the time-series. For this reason, the analysis of results obtained from the study will depend to a greater extent on the cross-section results.

It is intended that the empirical results of this study give an insight into the theoretical controversy of stock valuation. The study is based on a representative market environment. Thus, the results may be used by investors and corporations alike as an aid for rational investment decisions. A corporation will find the model of value insofar as the price of their stocks influence their financial plans. An investor may use the resulting model to discover profitable investment opportunities by giving special consideration to stocks selling at a price above or below the price predicted by the model. It should be pointed out that the model itself is not adequate by itself as a basis for investment decisions, that is, it must be used in conjunction with other factors.

CHAPTER II

THEORETICAL FRAMEWORK OF THE DIVIDENDS-EARNINGS CONTROVERSY

The object of this chapter is to review the literature concerning stock valuation and determine the present state of controversy regarding the relative influence of dividends and earnings on stock prices. An analysis of the viewpoints of the main proponents of both sides of the controversy will be provided. Important supporting arguments of other writers will also be discussed.

A Review of the Controversy

Writers on stock valuation can be divided into two main schools of thought. One school maintains that stock prices are independent of changes in dividends paid to stockholders; the other maintains that stock prices are significantly affected by changes in dividends.

The co-authors, F. Modigliani and M.H. Miller, are the main proponents of the first school of thought. M.J. Gordon represents the second school of thought which suggests that stock prices are significantly affected by changes in dividends. Within this school there exists another minor controversy- namely, which of dividends or retained earnings have a greater influence on stock prices.

The Views of Modigliani and Miller

With respect to the significance of dividend policy in stock valuation, Modigliani and Miller make the following statement:

> Like many other propositions in economics, the irrelevance of dividend policy, given investment policy, is "obvious, once you think of it." It is, after all, merely one more instance of the general principle that there are no "financial illusions" in a rational and perfect economic environment. Values there are determined solely by "real" considerations - in this case the earning power of the firm's assets and its investment policy - and not by how the fruits of the earning power are "packaged" for distribution. [1]

Assuming a perfect capital market, rational behavior on the part of the investor, and certainty, Modigliani and Miller adopt the following fundamental principle of valuation: "... the price of each share must be such that the rate of return (dividends plus capital gains per dollar invested) on every share will be the same throughout the market over any given interval of time." [2]

On the basis of this principle, they develop a formula for the value of a firm. Given this formula for the value of a firm one can arrive at the value of a share by dividing by the number of shares outstanding.

Thus, the value of a firm, V(t), is given by the following formula: [3]

$$V(t) = \frac{1}{1 + \rho(t)} \left[D(t) + V(t+1) - m(t+1)\, p(t+1) \right]$$

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1. Merton H. Miller and Franco Modigliani, "Dividend Policy, Growth and the Valuation of Shares", in The Theory of Business Finance: A Book of Readings, ed. by S.H. Archer and C. D'Ambrosio (New York: The MacMillan Book Co., 1967), p. 343.

2. Ibid, p. 340

3. Ibid, p. 341

where, n(t) represents the number of shares outstanding at the beginning of time t;

(t) represents the cost of capital;

m(t+1) represents the number of new shares sold during time t at the ex-dividend closing price, p(t+1);

V(t) = n(t) p(t) represents the total value of the firm;

D(t) = n(t) d(t) represents the total dividends paid during time t to those shareholders registered at the beginning of t.

Modigliani and Miller contend that dividend policy will affect V(t) directly through its influence on the two terms D(t) and -m(t+1) p(t+1). A change in the dividend per share, d(t), will affect D(t) because D(t) = n(t) d(t). The term, -m(t+1) p(t+1), represents the value of new shares sold during time t, and will be affected because ".. the higher the dividend payout in any period the more the new capital that must be raised from external sources to maintain any desired level of investment".[4]

The justification for the argument that the value of the firm is independent of dividend policy lies in the fact that V(t) is positively influenced by D(t) and negatively by m(t+1) p(t+1). In the "ideal world" as outlined in the assumptions of Modigliani and Miller, these two effects must always cancel out, leaving the value of the firm unaffected.

Assuming that I(t) is the given level of the firm's investment in time t and X(t) is the net profit in time t, the amount of capital required from outside sources is:

$$m(t+1)\ p(t+1) = I(t) - X(t) - D(t)$$

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4. Ibid, p. 342.

Substituting the right hand side of the above equation for the last term of the original equation for the value of a firm, it is seen that D(t) cancels and the following equation is obtained:

$$V(t) = \frac{1}{1 + \rho(t)}\left[X(t) - I(t) + V(t+1)\right]$$

Because all terms on the right hand side of the above equation are independent of dividend policy, the value of the firm is independent of dividend policy.

Modigliani and Miller have examined four different approaches to the valuation of shares: (1) discounted cash flow; (2) current earnings plus future investment opportunities; (3) stream of dividends approach; and (4) the stream of earnings approach. In their examination, Modigliani and Miller show that all four approaches to share valuation can be algebraically reduced to the above formula. Therefore, stock prices are independent of dividend policy no matter which of the four approaches to share valuation is adopted.

Analysis of the View that Prices are Affected by Dividends and Earnings

As suggested in the introduction to this chapter, the main proponent of this second school of thought is M.J. Gordon. He contends that a corporation's share price is not independent of the dividend rate paid to stockholders, and this contention is, of course, the exact opposite to that of Modigliani and Miller.

A share of stock can provide the following three types of future income: (1) the future earnings per share; (2) the future dividends per share; and (3) the future

dividends for a finite number of periods plus the price at the end of that time.[5] Gordon assumes that investors buy a share on the basis of expected future dividends. However, he shows that share valuation based on future dividends is algebraically equivalent to share valuation based on future earnings.[6]

Gordon's argument rests on the contention that the uncertainty of a dividend increases with time in the future and that investors have an aversion to uncertainty. Investors arrive at a share value by discounting dividends at the cost of capital, k, which reflects uncertainty. It follows that the discount rate increases with time because the uncertainty of a dividend increases with time.

Gordon argues that when valuing a share, investors discount expected dividends at k which is an average of k_t, t = 1, 2, 3 ... = time period, and $k_t > k_t - 1$ as discussed above. If for some reason the dividend in the first period is zero, the new discount rate, k*, which is an average of k_t, t = 2, 3, 4 ..., is greater than k because $k_t > k_t - 1$. It follows, therefore, that the price of a share using the discount rate k* will be less than the price of a share computed by using k as the discount rate.

In Gordon's words:

> The dividend policy changed: the near dividend was reduced, and the distant dividends were raised. This caused a rise in the discount rate, and the result was

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5. M.J. Gordon, The Investment, Financing and Valuation of the Corporation, (Homewood, Illinois: R.D. Irwin Inc., 1962), p. 44.

6. Ibid, p. 61

a fall in the price of the share. I, therefore, say that the change in the dividend policy changed the share's price.[7]

Gordon bases his argument on the assumption that the rate of return on investment, r, is equal to the cost of capital, k. If r is greater than k, the price of the share will increase because of the "profitability of investment" and not because of the change in the time distribution of dividends.

Other Views Concerning Share Valuation

In the last twenty years a considerable amount of statistical work has been done in an attempt to determine the relative importance of dividends and earnings in share valuation. Despite this, no final answer has been found.

Ezra Solomon contends that there is in fact no controversy if the issue is analyzed correctly. He states:

> When dividends are equal to earnings, no problem exists; when dividends are not equal to earnings, the firm is expanding through the use of retained earnings and in this case neither dividends per se nor earnings per se can provide an adequate basis for measuring the returns which investors capitalize in arriving at a market price...
>
> A correct model must take into account the anticipated flow of net earnings and the reinvestment of such earnings as is required to achieve the anticipated flow, as well as the benefits from this reinvestment.[8]

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7. M.J. Gordon, "Optimal Investment and Financing Policy", The Theory of Business Finance: A Book of Readings, ed. by S.H. Archer and C. D'Ambrosio (New York: The MacMillan Book Co., 1967), p. 369.

8. Ezra Solomon, The Theory of Financial Management (New York: Columbia University Press, 1963), p. 58

Meader was one of the first to use multiple regression analysis to explain stock prices. Of five determinants used in the regression equation, he found dividends to be the most important, and earnings the next best in explaining stock prices.[9]

Separate statistical studies conducted by Burrell, Pastoriza, and Young suggest that dividends have a greater influence on stock prices.[10] David Durand also conducted an extensive study using 117 bank stocks in the U.S.A. Again, in most cases, dividends had the highest regression coefficients. However, there were numerous exceptions.[11]

Dividends, Earnings and Growth

It is generally accepted that growth companies typically have a higher retention rate than non-growth companies; and also, that earnings are more valued by investors than in the case of non-growth companies. It is, therefore, expected that the price-

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9. J.W. Meader, "A Formula for Determining Basic Values Underlying Common Stock Prices", The Annalist, (November 29, 1935), p. 749.

10. For details of these studies see: O.K. Burrell, "The Relative Value of Earnings: Retained and Distributed", The Commercial and Financial Chronicle, (July 18, 1957), p. 2
Harold H. Young, "A Study of Factors Influencing Price-Earnings Ratios of Utility Common Stocks", The Analyst's Journal, I, No. 1, (January, 1945), pp. 45-48.
Hugh Pastoriza, "Valuing Utility Earnings, Distributed and Retained", The Analyst's Journal, I, No. 3, (July, 1945), pp. 14-18.

11. David Durand, Bank Stock Prices and the Bank Capital Problem (Occasional Paper 54; New York: National Bureau of Economic Research, Inc., 1957)

earnings and dividend-earnings ratios are negatively correlated for a growth firm. However, a study by Harkavy on the Cowles Commission Chemicals Index shows that they are, in fact, positively correlated.[12]

Many other informed writers have also considered the problem of the valuation of growth stocks. Analytically, a growth firm is one whose rate of return on additional investment is greater than the market capitalization rate.

Weston and Brigham have shown that the growth stock valuation models of Solomon, Gordon and Shapiro, Modigliani and Miller, and Walter, can all be algebraically reduced to one formula and hence, have similar policy implications.[13] The general implication of their analysis is that if the rate of return on additional investment is greater than the market capitalization rate, then the lower the dividend payout of the firm, the higher will be the value of the firm's common stock.[14]

Changes in the dividend policy of a firm will affect the common stock price of that firm in different ways depending on the relation of the firm's rate of return on additional investment to the market capitalization rate. As an example of a model which explains these different effects, the model proposed by Walter is presented

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12. Oscar Harkavy, "The Relation Between Retained Earnings and Common Stock Prices for Large, Listed Corporations", The Journal of Finance, VIII, No. 3, (September, 1953), pp. 287-88.

13. J. Fred Weston and Eugene F. Brigham, Managerial Finance, (New York: Holt, Rinehart and Winston, 1966), pp. 477-484.

14. Ibid, p. 482.

below in detail.

Mathematically, Walter expressed the present value of a common stock by the following equation:

$$Vc = \frac{D}{Rc} + \frac{\frac{Ra}{Rc}(E-D)}{Rc} \qquad 15$$

where, D represents cash dividends, E represents earnings, Ra represents the rate of return on additional investment, and Rc represents the market capitalization rate.

For a typical growth firm Ra will exceed Rc; that is, the rate of return on additional investment will exceed the market capitalization rate. The market capitalization rate reflects the risk factor associated with a particular industry and also the source of funds used for the investment. In other words, if debt were used to finance the investment, the capitalization rate would be higher than if retained earnings were the source of funds.

The right hand side of the equation consists of two parts. The first term, D/Rc, is the present level of dividends capitalized at the market rate. The second part of the equation represents incremental earnings due to additional investments capitalized at the same market rate. Given that the firm in question is a growth firm such that Ra is greater than Rc (and Ra/Rc is greater than one), $\frac{\frac{Ra}{Rc}(E-D)}{Rc}$ varies inversely with D.

15. J.E. Walter, "Dividend Policies and Common Stock Prices", The Journal of Finance, XI, No. 1 (March, 1956), p. 34

It is concluded, therefore, that if Ra is greater than Rc, the present worth of future dividends resulting from invested retained earnings is greater than the dollar value of retained earnings; or, the retention of earnings is beneficial to stockholders. If Ra is equal to Rc, Vc is independent of D and is directly dependent on E. If Ra is less than Rc, Vc increases as D increases.

Graham and Dodd treat growth stocks and other securities separately. They suggest that the earnings of a growth stock should double in ten years; the stock should be valued almost entirely on the basis of expected earnings. For non-growth stock, they suggest that a dollar paid out in dividends should carry four times the weight of a dollar of retained earnings in stock valuation.[16]

Numerous other studies have been carried out using other independent variables and different statistical techniques. Baranek, for example, proposed a model which takes into account variables in addition to dividends and earnings. His equation is as follows:

$$V = a_0 + a_1 Y + a_2 Y^2 + a_3 D + a_4 D^2 + a_5 L + a_6 L^2 + a_7 S + a_8 S^2 + a_9 A + a_{10} U^7$$

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16. Benjamin Graham, David L. Dodd, and Sidney Cottle, Security Analysis (4th ed., New York: McGraw-Hill Book Company, Inc., 1962), p. 517-38.

17. William Baranek, Analysis for Financial Decisions (Homewood, Illinois: Richard D. Irwin, Inc., 1963), p. 225.

where, V = annual average total market value of common stock,

Y = total earnings,

D = total dividends,

L = leverage (ratio of debt to total assets),

S = number of shares outstanding,

A = total assets,

U = variability of gross earnings.

Using eighty-eight randomly selected firms from the New York Stock Exchange and 1955 data, the following values for the coefficients were obtained:

$$V = 8.43 + 3.17\,Y - .02\,Y^2 + 4.86\,D + .30\,D^2 - 24.74\,L + 4.35\,L^2 + 22.38\,S - 05\,S^2 - .002\,A - .52\,U$$

One of the questions to be answered by this study is whether the relative importance of earnings and dividends in stock valuation changes over time. Therefore, it should be remembered that the results of the studies discussed in this chapter reflect investor sentiments only as they were in the time period with which any particular study is concerned.

CHAPTER III

APPROACH AND METHODOLOGY

As was mentioned previously, the basic question to be investigated in this study is whether investors value a common stock share on the basis of earnings, dividends, or both. Further, does the approach to stock valuation in Canada vary over time and among industries? To answer these questions, data concerning price, earnings, and dividends of four industries have been subjected to both time-series and cross-section regressions.

This chapter is divided into two parts. The first part discusses multiple regression analysis in general and its assumptions. The second part of the chapter consists of the model used in this study, a discussion regarding the selected industries, the source and nature of data, and the extent to which the data satisfies the assumptions of multiple regression analysis.

Multiple Regression Analysis

Regression analysis is frequently used in economics and business research to determine the nature of relationships between two or more variables. A multiple linear regression model consists of an equation which expresses a dependent variable as a function of two more more independent variables. Such a linear regression equation can be written as

$$Y = a + b_1X_1 + b_2X_2 + \ldots + u$$

where, Y represents the actual value of the dependent variable Y, and X_1, X_2, ... represent the independent variables. The terms b_1, b_2, ... represent the

regression coefficients; thus b_i is an estimate of the change in the dependent variable Y, caused by a unit change in the independent variable X_i, holding all other independent variables constant.

The term u represents the difference between Ye and Y or, the difference between the estimated and the observed values of the dependent variables. The residual u, may be due to various factors. First, it is likely that the relationship between the dependent and the independent variables is not exactly linear although this departure from exact linear dependency is not enough to warrant a curvilinear regression analysis. Second, economic statistics frequently contain errors of measurement, so that they are only an approximation to the underlying "true" values. Third, there may be independent variables which significantly affect the dependent variable but are not included in the regression model.

The data used in regression analysis is usually from a representative sample of a specific population. From the regression analysis, statistical inferences can be made regarding the population. The validity of such inferences is directly dependent on the degree to which the assumptions of regression analysis are satisfied.

The first assumption is that there must be a linear relationship between the dependent and each of the independent variables. To test for this assumption, the dependent variable can be plotted on a graph against each of the independent variables.

The second assumption is the absence of a high degree of correlation between any two of the independent variables. If this assumption is not satisfied, multicollinearity is said to exist. The presence of multicollinearity will result in

making the estimate of the regression coefficients unreliable. Multicollinearity is reflected in the standard error of individual regression coefficients, that is, the higher the correlation between the independent variables, the higher will be their standard errors. This can be explained by the formula for computing the standard error of the regression coefficient, b_1 :

$$s_{b_1} = \frac{S_{y.12}}{x_1^2 \left(1 - r_{1.2}^2\right)} \qquad 1$$

where, $S_{y.12}$ is the standard error of estimate and $r_{1.2}$ is the correlation coefficient between the independent variables X_1 and X_2. As $r_{1.2}$ approaches one (perfect correlation), the denominator of the equation approaches zero, and the standard error of the regression coefficient becomes larger, making the regression coefficient unreliable.

It may be pointed out that even though the individual regression coefficients are made unreliable by the presence of multicollinearity, the predictive power of the regression equation is not necessarily affected; that is, the standard error of estimate may not increase. According to Johnston:

> If forecasting is a primary objective, the intercorrelation of explanatory variables may not be too serious, provided it may reasonably be expected to continue in the future.[2]

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1. William A. Spurr and Charles P. Bonini, Statistical Analysis for Business Decisions, (Homewood, Illinois: Richard D. Irwin, Inc., 1967), p. 610.

2. J. Johnston, Econometric Methods (New York: McGraw-Hill Book Company, Inc., 1963), p. 207.

Typically, multicollinearity is a greater problem in time-series than in cross-section regressions. For this reason, the validity of results and conclusions can be reinforced by subjecting a given set of data to both time-series and cross-section regressions. With regard to this approach, Johnston states that "this combined use of time series and cross-section data is now conventional practise in demand studies".[3] Admittedly, Johnston is referring to a particular application of regression analysis, but this approach to dealing with the problem of multicollinearity can be used in other applications as well.

The third assumption relates to the residual, u. The term u, which is also referred to as the residual value, should be normally distributed with an expected value of zero and should have a constant standard deviation for all values of the independent variables. This latter property of the residuals is known as homoscedasticity and implies that the residual values are uniformly dispersed around the regression line. If the assumption of homoscedasticity is not satisfied, a mathematical transformation of the data is required to produce the desired even dispersion of the residuals.

The fourth assumption requires that the residuals are independent of each other (or, that they are not serially correlated). This property of the residuals is known as autocorrelation and often occurs in time-series regressions. The presence of auto-correlation in the residuals implies that they are not randomly distributed around the regression line. In the case of positive autocorrelation, residuals tend to cluster together either above or below the line; in the case of negative autocorrelation, residuals tend to alternate above and below the line. Johnston suggests

3. Ibid., p. 207.

that there are three main consequences of autocorrelation:

> First, we shall obtain unbiased estimates of (b_1, b_2, b_3, ...) but the sampling variances of these estimates may be unduly large compared with those achievable by a slightly different method of estimation. Second, if we apply the usual least-squares formula for the sampling variances of the regression coefficients, we are likely to obtain a serious underestimate of these variances. In any case, these formulas are no longer valid, nor are the precise forms of the t and F tests... Third, we shall obtain inefficient predictions, that is, predictions with needlessly large sampling variances.[4]

Either the Durbin-Watson d statistic or the von Neuman ratio can be used to test for the presence of autocorrelation. The von Neuman ratio is given by the following equation:[5]

$$K = \frac{\frac{\sum_1 (Z_{t-1} - Z_t)^2}{n-1}}{\frac{\sum_1 Z_t^2}{n}}$$

where, Z_t ($t = 1,2,3,\ldots n$) are the residuals. If positive autocorrelation exists, the von Neuman ratio is small; if negative autocorrelation exists, the von Neuman ratio is large. If the ratio is near 2, little or no autocorrelation is present.[6]

If autocorrelation exists in the residuals of a given set of data, a mathematical transformation is required to overcome the problem. The procedure outlined by Johnston is as follows.

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4. Ibid., p. 179

5. Mordecai Ezikiel and Karl A. Fox, Methods of Correlation and Regression Analysis (3rd ed., New York: John Wiley & Sons Inc., 1959), p. 340 .

6. Carl F. Christ, Econometric Models and Methods (New York: John Wiley & Sons, Inc., 1966), p. 523

Given the residuals $u_1, u_2, \ldots, u_n$, it is assumed that the autoregressive scheme is of the form,

$$u_t = \rho u_{t-1} + E_t$$

The term ρ is then estimated by computing the least-squares regression

$$u_t = b u_{t-1} + e_t$$

The coefficient r is then used to compute the transformed variables $(Y_t - bY_{t-1})$, $(X_{1t} - b X_{1,t-1})$, and $(X_{2t} - bX_{2,t-1})$. This set of transformed data is then again subjected to least-squares regression. If autocorrelation exists in the new set of residuals, the procedure can be repeated until a random set of residuals is obtained.

The Regression Model for the Study

In order to determine the relative importance of earnings and dividends in stock valuation, four industries were chosen for study and subjected to multiple regression. A number of firms were selected to represent each of the industries included in this study. The exact selection procedure for the firms in the four indistries will be outlined later in the chapter. It should be pointed out that throughout the study, when reference is made to the four industries, one of these is in fact not an industry but a group of firms selected from various industries on the basis of rapid price appreciation.

The industries were first subjected to time-series regression to determine whether the relative importance of earnings and dividends varied among the four industries. The time period selected for the study is from 1956 to 1967. The industries were

then subjected to cross-section regression using each of the twelve years as a base year. The reasons for the cross-section regression are two-fold. First, to determine whether the relative weights placed on earnings and dividends in stock valuation vary from year to year for each of the industries. Second, to substantiate the results of the time-series regressions which are not conclusive because of a very high degree of multicollinearity.

Investors are interested in return in the form of dividends and price appreciation. Therefore, in this study, price per share is expressed as function of earnings per share and dividends per share. The model is represented by the following equation:

$$P = a + b_1 E + b_2 D + u$$

where, P represents price per share, E represents earnings per share, and D represents dividends per share. The coefficients b_1 and b_2 represent the weight which the market places on earnings and dividends respectively when valuing a stock. The The term u represents the residual value between the estimated price per share and the observed price per share. This variance is a result of the departure of price from its exact linear dependence on earnings and dividends.

As was mentioned at the beginning of this section of the chapter, both time-series and cross-section regression analysis is used in this study. These two models are now discussed separately.

Time-Series Regression Model

For the time-series regressions, price, earnings, and

dividend indexes were calculated for each year and for each industry. The indexes were calculated as an average of the individual firm statistics (price, earnings, and dividends), weighted by the number of shares outstanding in a particular year. All indexes are listed in Appendix B.

Price, earnings, and dividend indexes for each of the four industries were subjected to time-series regressions over the period from 1956 to 1967.[9] The time-series model can be represented by the following equation:

$$P_t = a_0 + a_1 E_t + a_2 D_t + u$$

where, t = 1956, 1957, ..., 1967. The assumption is made that the parameters a_0, a_1 and a_2 apply without change in every year from 1956 to 1967.

Cross-Section Regression Model

Price per share, earnings per share, and dividends per share for those firms included in each of the four industries were subjected to cross-section regressions for each year from 1956 to 1967. One additional regression was run for the separate group of growth firms for 1968.

The cross-section model can be represented by the following equation:

$$P_i = b_0 + b_1 E_i + b_2 D_i + z$$

where, i = 1, 2, 3, ..., n, and n represents the number of firms in the industry.

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9. All calculations were performed on the IBM 360/67 at The University of Alberta with the aid of programs included in STATPACK 2: An APL Statistical Package, 2nd ed., by K.W. Smillie.

Here the assumption is made that the parameters b_0, b_1 and b_2 apply without change for every i, or for every firm in a particular year.

The Industries Selected for Study

The four industries chosen for the study are the following: (1) the printing and publishing industry, (2) the gas distribution industry, (3) the utilities industry, and (4) a group of growth firms from various industries. These industries have been selected in such a way that growth stock valuation can be compared to non-growth stock valuation. In this study a growth stock is defined only in terms of price appreciation, that is, a growth stock is one which has experienced above average price appreciation over a specified period of time.

To determine which industries in the Canadian economy experienced the greatest price appreciation from 1956 to 1967, the weekly feature in The Financial Post was used, which is titled "Your Guide to the Stock Price Averages". This feature contains weekly stock price indexes by industry which are calculated by The Dominion Bureau of Statistics (1956 is set to 100.0). On May 15, 1969, the two industries with the highest price index were printing and publishing, and gas distribution. The indexes for these two industries are 840.2 and 458.2 respectively, while the stock price index of all industrials was 221.0 on the above mentioned date. Data was not readily available for all firms used to calculate the D.B.S. indexes. Thus some of the firms had to be omitted for this study. This resulted in reversing the relative sizes of the price indexes of the printing and publishing industry and the gas distribution industry. If the index of all industrials is considered average for the economy, it is evident that the price appreciation of the printing and publishing

industry and the gas distribution industry stocks are much above average.

As was mentioned earlier, the industries were selected to allow for the comparison of growth stock valuation to non-growth stock valuation. The utilities industry is included in the study as a non-growth industry. The price index for this industry increased from 100.0 to 193.7 from 1956 to 1967 and this increase is much smaller than for the printing and publishing, and the gas distribution industry.

All the firms included in the study for each of the industries are those firms in a particular industry which were included in The Financial Post Survey of Industrials every year from 1956 to 1967. This Survey includes most of the firms that are listed on the major Canadian stock exchanges. It should be pointed out that the firms within each of the three actual industries are not necessarily the same ones which are used to calculate the D.B.S. industry indexes. The firms in the study have been selected on the basis of the information available for the time period being studied. As mentioned earlier, the fourth "industry" is a selection of firms from various industries. This industry includes all the firms that appeared in The Financial Post Survey of Industrials whose price increased at least five-fold from 1956 to 1967. This industry is also considered a growth industry because of the rapid price appreciation of the shares of its firms.

All data regarding price per share, earnings per share, dividends per share, and the number of shares outstanding for individual firms were obtained from The Financial Post Survey of Industrials (1956 to 1967). The price per share for a firm used in the study in a particular year is the average of the high and low prices for that particular year. All three variables were adjusted for stock splits by expressing them in terms of the

number of shares outstanding before the stock split was put into effect. Thus, if a three-for-one split was made, all observed values of the three variables after the split were multiplied by three.

Test of Assumptions

It is pointed out earlier in this chapter that the results of a regression model are valid only to the extent to which its assumptions are satisfied. The assumptions of linearity, autocorrelation, and multicollinearity were tested for this study. Tests of these three assumptions relative to this study are discussed separately below.

Linearity. - For the time-series regressions, price indexes were plotted separately against earnings indexes and dividend indexes for each of the four industries. The resulting graphs are presented in Figures 1 to 4 of Appendix C. The graphs indicate that there is an approximate linear relationship between price and earnings, and price and dividends.

In order to test for the assumption of linearity for the cross-section regressions, a representative year was chosen for each of the four industries. Again the assumption of linearity was satisfied as seen in Figures 5 to 8 of Appendix C.

Autocorrelation. - The von Neuman ratio was used to test for autocorrelation in the residuals. Positive autocorrelation was found to exist only in the utilities industry. The problem was solved by following the procedure outlined in the first part of this chapter. The regression coefficient, b, for the residuals was found to be .21 and was then used to transform the price, earnings and dividends data for the utilities industry.

Multicollinearity. - The assumption of independence between the independent

variables was tested by the simple correlation coefficient between earnings per share and dividends per share. It was found that multicollinearity was a severe problem in the time-series regressions. The simple correlation coefficient between earnings and dividends was found to be .98 for the printing and publishing industry, the gas distribution industry, and the utilities industry. For the group of growth firms the correlation coefficient was .94.

Therefore, the regression coefficients for earnings and dividends in the time-series are unreliable and must be given special consideration. One way to test the validity of results is to see if the statistical results are consistent with theory. It will be seen in the next chapter that in most of the cases the regression results can be supported on theoretical grounds.

The problem of multicollinearity was found to be less severe in the cross-section regressions and thus, these results are more reliable than the time-series results. The results of cross-section regressions are valid also because successive base years were studied over a twelve year period. The time period studied is long enough to be able to observe significant trends in the relative size of the regression coefficients.

It has been suggested that the time-series model which is used in this study is too simple to yield reliable results. In particular, it is felt that the problems of autocorrelation and multicollinearity make the economic significance of the results of the time-series model so questionable that investigators have generally not employed this simple model. Gordon suggests that "... the unsatisfactory nature of the findings is due largely

to the inadequacy of the theory employed in interpreting the model".[10] In this study it is felt that the model is useful and will yield reliable results if it is employed and interpreted correctly and if it is supplemented by the cross-section model.

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10. M.J. Gordon, "Dividends, Earnings, and Stock Prices", The Review of Economics and Statistics, XLI, No. 2, Part 1 (May, 1959), p. 142.

CHAPTER IV

ANALYSIS OF RESULTS

The results of this study are presented and analyzed separately for each of the four industries mentioned in the previous chapter. First, the regression results of the three industries associated with growth characteristics are presented and analyzed. This is followed by a discussion of the regression results of the non-growth utilities industry.

The discussion of results includes some remarks about the nature of the particular industry being discussed and in some cases, reference will be made to the relative movement of stock prices, earnings and dividends of a particular industry in a particular period of time. The results of both the time-series and the cross-section regressions are presented but the analysis and conclusion are largely based on cross-section regression results. The results obtained from the regressions will be discussed within a theoretical framework to draw meaningful conclusions.

Printing and Publishing Industry

According to the stock price indexes calculated by the Dominion Bureau of Statistics, the printing and publishing industry experienced the greatest price appreciation from 1956 to 1967. For this reason, this industry was included in the study as a growth industry. The price index calculated for the printing and publishing industry in this study increased from 100.0 to 615.2 from 1956 to 1967.

As seen in Table 1, the time-series regression coefficients for this industry are .96 and 1.31for earnings and dividends respectively. The t values indicate that only the dividends coefficient is statistically significant at the five per cent level. At first glance, these results may lead one to conclude that investors determine the value of printing and publishing stocks solely on the basis of dividends. It is difficult to support such a conclusion on theoretical grounds. As discussed in Chapter II, stock valuation theory suggests that growth stocks should be valued on the basis of earnings rather than dividends.

The difference between the above empirical results and the theory is, perhaps, due to the high degree of multicollinearity present in the time-series data of the printing and publishing industry. It was shown in the preceding chapter that individual regression coefficients are unreliable if the independent variables are highly correlated. In this case, the simple correlation coefficient between earnings per share and dividends per share is .98, indicating almost perfect correlation. Therefore, it is difficult to consider the time-series results meaningful.

Cross-section regressions were run to complement the time-series results and to determine whether investor sentiments with regard to stock valuation changed over time. The results of the cross-section regressions of the printing and publishing industry are presented in Table 2. The results indicate that the dividends coefficient is larger for seven of the twelve years and the earnings coefficient is larger for the remaining five years. If the time-series regression coefficients are considered an

TABLE 1

REGRESSION OF PRICE PER SHARE ON EARNINGS PER SHARE AND DIVIDENDS PER SHARE FOR THE FOUR INDUSTRIES

Industry Sample	Constant	Regression Coefficients: (and t values) Earnings	Dividends	Correlation: Earnings vs Dividends	R^2	F-Ratio	Standard Error of Estimate	Von Neuman's Ratio
Printing and Publishing	-103.96	.96 (1.24)	1.31 (1.96)	.98	.96	102.6	34.36	1.74
Gas Distribution	88.15	.16 (.84)	.53 (2.05)	.98	.96	116.0	33.39	1.88
Utilities	-2.98	.95 (2.04)	.19 (.59)	.98	.95	77.2	9.55	1.70
Random Growth	-23.47	.48 (3.24)	1.03 (4.47)	.94	.98	247.2	28.39	1.79

TABLE 2

REGRESSION OF PRICE PER SHARE ON EARNINGS PER SHARE AND DIVIDENDS PER SHARE

Printing and Publishing Industry

Base Year	Constant	Coefficients: (and t values) Earnings	Dividends	Correlation: Earnings vs Dividends	R^2	Standard Error of Estimate
1956	5.18	.81 (.64)	22.48 (10.00)	.77	.99	2.16
1957	-.10	4.66 (1.35)	16.95 (2.71)	.78	.97	6.03
1958	2.22	5.97 (.49)	17.31 (.53)	.90	.84	19.31
1959	10.21	17.11 (1.26)	-14.05 (-.50)	.98	.94	11.77
1960	-3.77	15.50 (1.83)	11.50 (.40)	.81	.93	5.00
1961	-9.78	29.78 (1.24)	6.08 (.01)	.91	.90	10.27

Printing and Publishing Industry (continued)

Base Year	Constant	Coefficients: (and t values) Earnings	Dividends	Correlation: Earnings vs Dividends	R^2	Standard Error of Estimate
1962	-19.02	23.62 (7.04)	16.28 (2.22)	.01	.98	3.73
1963	-18.39	23.38 (42.73)	15.66 (1.40)	.83	.99	.30
1964	-20.95	12.26 (1.33)	37.92 (1.69)	.66	.93	8.73
1965	-17.80	10.55 (.52)	35.46 (.77)	.77	.78	18.74
1966	-17.62	13.47 (1.34)	29.18 (1.00)	.75	.92	13.08
1967	17.50	1.17 (.18)	19.07 (1.36)	.53	.75	6.73

average for the twelve years, then the cross-section results do, in fact, agree with the time-series results. The time-series regression indicates that dividends are more important and in the cross-section regressions, dividends are more important in more years than earnings.

The cross-section results indicate that investor sentiments did in fact change over time. During the three year period from 1956 to 1958, dividend coefficients are greater than earnings coefficients. In 1959 a shift in investors' preference seems to have taken place. From 1959 to 1963, earnings coefficients are greater. In 1964 another shift took place, such that from 1964 to 1967 the dividends coefficient is greater than the coefficient of earnings.

The cross-section results in this study are meaningful because the relative sizes of the regression coefficients do not fluctuate from year to year. For example, in the case of the printing and publishing industry there is a five-year period in which the earnings coefficient is significantly greater than the dividends coefficient.

The cross-section results of the printing and publishing industry are more conclusive than the time-series results because the problem of multicollinearity is less severe. An average was calculated of the simple correlation coefficients between earnings and dividends for the twelve years which are used as base years in the cross-section regressions. This average value of the correlation coefficients is .72. Thus .72, which indicates the degree of multicollinearity in the cross-section regressions, is significantly less than .98, the degree of multicollinearity in the time-series.

Several reasons can be given for the shift in investor preference from dividends to earnings and then back to dividends. In the case of growth stocks, the monetary gain to the stockholder is greater if the firm invests earnings instead of paying them out in the form of dividends. Ordinarily the return to investors in growth stocks is expected in the form of price appreciation rather than dividends. Therefore, growth stocks should be valued on the basis of anticipated earnings rather than anticipated dividends. However, there is a greater degree of risk associated with anticipated earnings than with anticipated dividends and this risk must, of course, be borne by investors.

Graham contends that in the past fifteen years the average American investors have finally begun to accept the additional risk associated with valuing stocks on the basis of anticipated earnings and thus expect return in the form of capital gains rather than dividends.[1] One of the reasons for this shift from dividends to earnings may be the improved economic conditions of the past fifteen to twenty years. For many years after the depression of the early 1930's, investors feared the recurrence of such a depression. However, as time passed and economic conditions continued to improve, this fear abated and earnings of firms appeared less risky. Investors had begun to realize that economic theory has developed to the point where serious depressions can be averted.

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1. Benjamin Graham, The Intelligent Investor (3rd ed., rev., New York: Harper & Row Publishers, 1965), p. 286.

The price-earnings ratio can be considered a measure of the confidence with which investors view the growth potential of a firm in an industry. In the case of the printing and publishing industry, it is interesting to compare the average of the price-earnings ratios of the firms in the industry with the relative size of the earnings and dividends regression coefficients. From 1956 to 1958, the dividend coefficient is greater than the earnings coefficient and during these three years the average price-earnings ratio of the industry increased from 8.6 in 1956 to 28.2 in 1958. This rapid increase indicates a marked increase in the confidence of investors for growth in the industry. As the prospects for growth in an industry increase, investors are willing to assume the risk associated with earnings. It seems reasonable to assume, therefore, that this increase in the average price-earnings ratio brought about the shift in investor sentiments in 1959. From 1959 to 1963 the earnings regression coefficient is greater than the dividend coefficient. However, from 1959 to 1963 the average price-earnings ratio experienced a decline, indicating a decrease in investors' confidence for growth. The decline was from 28.2 in 1958 to 18.3 in 1963. Thus in 1964 another shift took place in investors' sentiments so that from 1964 to 1967 the dividend regression coefficients are greater than the earnings regression coefficients.

Gas Distribution Industry

This industry was selected for study on the basis of rapid price appreciation in the firms of this industry. According to the price indexes used in this study, price in this industry increased even more rapidly than that of the printing and publishing

industry.

The time-series regression coefficients of this industry are .16 and .53 for earnings and dividends respectively. Only the dividend coefficient is statistically significant at the five per cent level. According to these results, gas distribution stocks appear to be valued more on the basis of dividends than on earnings. If it is argued on the basis of rapid price appreciation, that this is a growth industry, then the time-series regression results cannot be supported on theoretical grounds. However, it will be shown that this industry has certain important characteristics of a non-growth industry which justify the kind of results obtained in the time-series regression.

Cross-section results of the gas distribution industry are in general agreement with the time-series results. From Table 3 it can be seen that the dividend regression coefficient is greater than the earnings coefficient in all years except 1966. This one difference in 1966 is not enough to draw any meaningful conclusion with regard to earnings being more important than dividends in stock valuation.

The cross-section results are more reliable than the time-series results because the problem of multicollinearity is less severe. The average of the correlation coefficients between earnings and dividends for the twelve years is .70. For the time-series the correlation coefficient is .98 which makes the time-series regression results unreliable.

The gas distribution industry is peculiar in the sense that is has both growth

TABLE 3

REGRESSION OF PRICE PER SHARE ON EARNINGS PER SHARE AND DIVIDENDS PER SHARE

Gas Distribution Industry

Base Year	Constant	Coefficients: (and t values) Earnings	Dividends	Correlation: Earnings vs Dividends	R^2	Standard Error of Estimate
1956	13.31	8.99 (.49)	9.98 (.27)	.94	.82	14.26
1957	1.41	1.09 (.07)	3.29 (.90)	.95	.91	12.95
1958	10.59	-12.20 (-.85)	59.80 (2.06)	.95	.95	11.40
1959	11.31	-2.50 (-6.90)	35.63 (21.68)	.62	.99	1.00
1960	12.08	.15 (.11)	4.27 (.24)	.68	.16	3. 68
1961	4.72	-.88 (-.87)	34.92 (4.47)	.81	.98	1.68

Gas Distribution Industry (continued)

Base Year	Constant	Coefficients: (and t values) Earnings	Dividends	Correlation Earnings vs Dividends	R^2	Standard Error of Estimate
1962	7.90	1.33 (9.38)	21.42 (33.55)	.73	.99	.17
1963	7.66	3.50 (3.58)	18.95 (5.13)	.60	.99	1.07
1964	7.54	3.77 (.99)	17.19 (1.55)	.46	.86	4.19
1965	7.68	6.80 (1.29)	17.23 (1.08)	.52	.85	6.11
1966	7.98	6.43 (7.00)	1.97 (.60)	.57	.99	1.11
1967	9.85	1.64 (2.50)	11.61 (3.13)	.61	.98	1.35

and non-growth characteristics. Macguire has suggested that the natural gas industry is on the threshold of a new era.[2] He argues that since World War II, this industry has tripled its number of customers and has increased gross revenue nearly ten times. The high rate of population growth has significantly contributed to the rapid growth of the industry by increasing the need for energy in domestic, commercial and industrial areas. The growth of the gas distribution industry is indicated by the earnings index calculated for this study. This index increased from 100.0 in 1956 to 736.5 in 1967. However, as Maguire points out, government regulations have tended to stifle incentive, the prime ingredient for expansion in any industry.

There has been a sharp divergence between common stock performance and growth in real output in the utility industry. This divergence is explained by Ferguson in terms of the government regulation imposed on this industry. This divergence is evident in the gas distribution price and earnings per share indexes calculated for this study. Real growth measured in earnings increased from 100.0 to 736.5 from 1956 to 1967 while the price index increased to only 621.2 during the same period. It is interesting to note also that from 1956 to 1967 the average of the price-earnings ratios of the firms in the industry decreased from 59.4 to 33.9. This

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2. W. G. Maguire, "Natural Gas: New Era for a Growth Industry", Financial Analyst's Journal, XVIII, No. 5 (September-October, 1962), p. 19.

3. Donald A. Ferguson, "Public Utilities: A Real Growth Industry of the 1950's", The Annalyst's Journal, XV, No. 1, February, 1959), p. 81

decrease indicates a decline in the confidence of investors for growth in the industry.

Therefore, the non-growth characteristics of the gas distribution industry justify the results of both the time-series and cross-section regressions.

Growth Firms

The firms included in this group are those whose price per share increased at least five-fold from 1956 to 1967. Some of the firms in this group belong to growth industries.

The time-series regression coefficients for this group, as shown in Table 1, are .48 and 1.03 for earnings and dividends respectively. Both coefficients are statistically significant at the five per cent level. Multicollinearity is again present although to a lesser degree than in the other three industries in the study. The simple correlation coefficient between dividends per share and earnings per share is .94. Thus, the time-series regression results are again unreliable. The smaller correlation between the independent variables is perhaps due to the lack of homogeneity among the firms in this group. The time-series results appear to contradict the theory. However, further light is thrown on the subject by the cross-section results.

The cross-section results presented in Table 4 indicate that from 1956 to 1966 dividends have a higher coefficient. In 1967 a shift in the preference of investors is found. The regression coefficients for earnings and dividends in 1967 are 6.51 and .34 respectively. For this group, an additional regression was run for 1968. In this year the coefficients for earnings and dividends are 8.17 and

TABLE 4
REGRESSION OF PRICE PER SHARE ON EARNINGS PER SHARE AND DIVIDENDS PER SHARE

Group of Growth Firms

Base Year	Constant	Coefficients: (and t values) Earnings	Dividends	Correlation: Earnings vs Dividends	R^2	Standard Error of Estimate
1956	-.11	7.78 (2.51)	5.03 (1.01)	.19	.49	14.16
1957	-1.21	3.53 (.95)	25.22 (3.00)	.77	.79	11.44
1958	-5.41	4.21 (.85)	31.49 (3.39)	.82	.85	11.49
1959	12.00	-4.84 (-.68)	26.88 (1.98)	.79	.40	11.67
1960	6.77	.27 (.03)	12.34 (.68)	.96	.43	8.54
1961	9.22	-4.03 (-.39)	26.93 (1.27)	.94	.46	12.07

Group of Growth Firms (continued)

Base Year	Constant	Coefficients: (and t values) Earnings	Dividends	Correlation: Earnings vs Dividends	R^2	Standard Error of Estimate
1962	4.96	2.86 (.68)	19.71 (2.36)	.82	.74	8.04
1963	5.32	6.11 (.95)	10.33 (.71)	.93	.72	10.19
1964	2.35	6.66 (1.25)	12.89 (1.16)	.68	.50	11.26
1965	2.91	7.80 (1.08)	11.96 (.72)	.82	.50	12.95
1966	3.12	-3.38 (-.48)	39.21 (1.71)	.86	.43	15.30
1967	11.54	6.51 (1.92)	.34 (.03)	.54	.37	7.35

and -2.70 respectively. Thus, the results for 1967 and 1968 indicate the beginning of a period in which earnings are more important than dividends for stock valuation. The results of these two years are very significant in terms of multicollinearity. The correlation coefficients between the independent variables, which measure multicollinearity, are .54 and .62 for 1967 and 1968. These coefficients are among the lowest for any industry or year in the study.

This group of firms cannot be considered in the same manner as the other industries, because there is little homogeneity among the firms. These firms are selected from industries associated with different degrees of risk, growth potentials, markets, and products. Nevertheless, these firms are similar with regard to rapid price appreciation.

In order to explain the shift in investors' preference from dividends to earnings, the same argument can be put forth that was used in the discussion of the printing and publishing industry. Namely, in the case of growth firms, it is beneficial to the stockholder for the firm to reinvest earnings rather than pay them out in the form of dividends. This means that growth stocks should ordinarily be valued on the basis of earnings instead of dividends. However, to value a stock on the basis of earnings, investors are required to assume a greater amount of risk because earnings are generally less stable than dividends. Graham has suggested that investors did not readily assume this risk until sometime in the last fifteen years. Obviously this shift in emphasis from dividends to earnings has not taken place at the same time for all industries.

According to Graham, the shift in investor preference from dividends to earnings in the U.S.A. took place in the middle 1950's. A similar shift seems to have taken place in Canada in the middle 1960's. Thus, Canadian market behavior seems to be approaching the market behavior in the U.S.A.

Utilities

The utilities industry was included in the study as a non-growth industry to allow the comparison of growth stock valuation with non-growth stock valuation. The price index of this industry increased from 100.0 to 209.0. This increase in price per share does not meet the rapid price appreciation requirement of a growth industry.

The time-series regression coefficients for earnings and dividends are .95 and .19 respectively. In this case only the earnings coefficient is significant at the five per cent level. This result is contrary to the theory regarding non-growth stock valuation. The individual regression coefficients are unreliable because the problem of multicollinearity is again severe. The correlation coefficient between earnings and dividends is .98. Because the time-series results are not meaningful, the analysis of the utilities industry will depend entirely on the cross-section results.

The cross-section results are presented in Table 5. The dividend coefficient is greater than the earnings coefficient for all years except 1966. These results

TABLE 5
REGRESSION OF PRICE PER SHARE ON EARNINGS PER SHARE AND DIVIDENDS PER SHARE

Utilities

Base Year	Constant	Coefficients: (and t values) Earnings	Dividends	Correlation: Earnings vs Dividends	R^2	Standard Error of Estimate
1956	12.96	6.35 (1.85)	7.84 (1.20)	.46	.44	15.65
1957	3.13	6.03 (1.72)	16.09 (2.38)	.57	.64	15.75
1958	8.68	3.52 (1.20)	13.53 (2.62)	.65	.66	11.20
1959	13.40	1.46 (.42)	10.82 (6.40)	.79	.51	11.57
1960	8.34	1.32 (.65)	15.58 (5.45)	.50	.80	7.90
1961	7.38	4.83 (1.31)	13.69 (2.51)	.81	.78	10.10

Utilities (continued)

Base Year	Constant	Coefficients: (and t values) Earnings	Dividends	Correlation: Earnings vs Dividends	R^2	Standard Error of Estimate
1962	3.97	7.46 (2.46)	12.00 (2.80)	.83	.88	8.35
1963	4.74	5.11 (1.72)	15.62 (3.93)	.77	.86	8.71
1964	-.05	1.06 (3.05)	1.18 (3.20)	.89	.94	6.32
1965	.56	5.31 (1.80)	19.44 (5.66)	.90	.96	5.45
1966	-.68	10.95 (4.67)	7.95 (2.89)	.90	.96	5.04
1967	2.95	7.95 (2.20)	9.82 (2. 34)	.85	.86	7.68

are in agreement with theory and are supported by the fact that they are similar to those of the gas distribution industry, which is also a public utility. The cross-section results are again more reliable because the problem of multicollinearity is not serious. The average of the simple correlation coefficients between earnings and dividends of the twelve years is .74.

Utilities in general are considered to have a high degree of stability in earnings, reasonable predictability of growth trends and a general improbability of sudden developments. Also, the industry does not possess the speculative growth possibilities found in manufacturing or some other industries.[4]

There is another reason why the utilities industry cannot be a growth industry and why its stocks are valued on the basis of dividends. All utility earnings and operations are controlled by government regulations. The government regulates the return on investment by regulating the rate for utility services and the level of earnings by regulating investment.

The above characteristics imply that return to the stockholder from investment in utility stocks come predominantly from dividend payments. Therefore, utility stocks should ordinarily be valued on the basis of anticipated dividends.

The regression results which have been presented in this chapter indicate that both earnings and dividends significantly affect stock prices and that the relative importance of these two variables vary among industries and over time. The analysis

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4. Benjamin Graham, David L. Dodd, and Sidney Cottle, Security Analysis, (4th. ed., New York: McGraw-Hill Book Company, Inc., 1962), p. 570.

of results indicates that the growth record and potential of an industry determine to a great extent whether earnings or dividends are more important in stock valuation.

CHAPTER V

SUMMARY AND CONCLUSION

Summary

This study has been concerned with two basic objectives: (1) to determine the relative weights placed on earnings and dividends in stock valuation, and (2) to determine if these weights vary among industries and over time. In order to attain these objectives, price, earnings, and dividends data were obtained for four Canadian industries for a period of twelve years. These data were then subjected to multiple regressions with price as the dependent variable and dividends and earnings as the independent variables. Both time-series and cross-section models were employed. The cross-section model was employed to determine if the importance of earnings and dividends changed from year to year and also to substantiate the results of the time-series regressions.

Both growth and non-growth industries were selected for the study so that growth stock valuation could be compared to non-growth stock valuation. At the outset, three of the selected industries were considered to have growth characteristics. However, it became evident that one of these three, the gas distribution industry, had more non-growth than growth characteristics. In this study, growth is defined in terms of rapid price appreciation.

Conclusion

The results of both the time-series and the cross-section regressions lead to the conclusion that both dividends and earnings significantly affect stock price as

contended by Gordon. It appears that the growth characteristics of an industry determine to a large extent whether earnings or dividends are more important in stock valuation. In the case of the printing and publishing industry and the group which was made up of various growth firms, earnings have a greater regression coefficient in certain time periods. In the case of the printing and publishing industry, this period was from 1959 to 1963. In this respect, the results support the neoclassical theory of stock valuation.

Further, it was found that the relative importance of dividends and earnings varies among industries and over time. A shift in investor sentiments took place from dividends to earnings in 1959 in the case of the printing and publishing industry. This shift is in agreement with the views of Graham who suggests that a general shift from dividends to earnings took place in the middle 1950's. In the case of the group made up of growth firms, this shift from dividends to earnings did not take place until 1967. Thus, Canadian investor sentiments seem to have shifted later than in the USA.

For the non-growth industries, the gas distribution industry and the utilities industry, no conclusive evidence was found to support the idea that earnings were more important than dividends. It appears that the stability of earnings caused by government regulation, and other non-growth characteristics of the industries prevent valuation of stocks on the basis of earnings.

The results of this study are similar to the results obtained by Albert J.

Fredman in the USA.[1] Fredman examined a number of industries on a cross-section basis. He found that a general shift took place in investor sentiments from dividends to earnings in the middle and late 1950's. This shift is particularily significant and pronounced for those industries which are considered to have growth characteristics. For example, the electrical and electronics industry experienced the shift in 1958 and the chemical industry in 1956. This is in general agreement with the shift in the printing and publishing industry found in this study. Fredman found no significant shift for any of the three utility industries included in his study. This is also in agreement with the results of this study.

The major problem encountered in this study is the problem of multicollinearity. However the problem was not severe in the case of the cross-section regressions. For this reason, the conclusions of the study have largely been based on the cross-section results. The cross-section results are meaningful also because a relatively long period of time is studied so that significant trends can be discovered regarding the relative importance of earnings and dividends.

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1. Albert J. Fredman, The Relative Significance of Earnings and Dividends as Determinants of Stock Prices over Time and Among Industries, unpublished manuscript, (University of California, Los Angeles, 1968.)

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APPENDIX A

FIRMS INCLUDED IN THE INDUSTRIES

PRINTING AND PUBLISHING

R.L. Crain
Moore Corporation
Southam Press
Sun Publishing

GAS DISTRIBUTION

Canadian Hydrocarbons
Consumer's Gas
Quebec Natural Gas
Union Gas

UTILITIES *

Interprovincial Pipelines
Pembina Pipelines
Trans-Canada Pipelines
Trans-Mountain Pipelines
Algoma Central Railway
Canada Steamship
Canadian Pacific Railway
Greyhound
Bell Telephone
B.C. Telephone
Quebec Telephone
Calgary Power
Newfoundland Light & Power
Nova Scotia Light & Power

GROUP OF GROWTH FIRMS

Ash Temple
Canada Bread
Canadian Hydrocarbons
R.L. Crain
Electrolux
Massey-Ferguson
Melcher's Distillery
Moore Corporation
Zellers
Consumer's Gas
Union Gas
Hubbard Dyers

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* It should be noted that some of the firms in this group (particularly the pipeline firms) did experience rapid earnings and dividend increases. In these cases the government did not exercise its right to regulate earnings.

APPENDIX B

INDUSTRY INDEXES USED FOR THE TIME-SERIES REGRESSIONS

(1956 - 1967)

PRINTING AND PUBLISHING

(per share)		
Earnings	Dividends	Price
100.0	100.0	100.0
104.3	115.3	117.4
101.9	117.7	142.7
126.9	123.3	225.3
130.5	143.4	213.3
132.6	168.5	298.8
144.0	189.9	281.8
152.0	201.3	299.8
180.7	221.8	342.6
223.7	255.5	417.8
249.2	276.9	463.7
277.6	313.4	615.2

GAS DISTRIBUTION

(Per share)		
Earnings	Dividends	Price
100.0	100.0	100.0
119.4	102.8	138.4
105.1	117.0	153.7
85.2	134.14	196.8
67.4	113.2	189.5
171.6	243.2	261.3
279.2	264.0	256.7
365.8	222.1	302.3
454.2	387.	352.6
566.2	431.1	443.3
734.0	562.1	471.3
932.4	736.5	621.5

UTILITIES *

(per share)		
Earnings	Dividends	Price
74.6	88.5	77.0
60.7	90.3	74.5
73.3	105.5	88.8
75.5	116.0	86.2
89.3	127.3	111.9
101.1	129.3	114.6
110.2	141.5	128.1
126.6	181.3	160.7
134.7	184.5	177.2
138.7	206.4	160.4
148.9	210.5	165.7

GROUP OF GROWTH FIRMS

(per share)		
Earnings	Dividends	Price
100.0	100.0	100.0
127.9	96.2	113.8
173.6	107.8	145.3
226.6	110.2	222.1
192.8	118.5	201.1
217.3	147.6	280.6
250.5	159.9	272.9
302.3	172.1	313.2
461.6	218.1	419.5
529.2	313.6	563.2
519.7	407.6	668.4

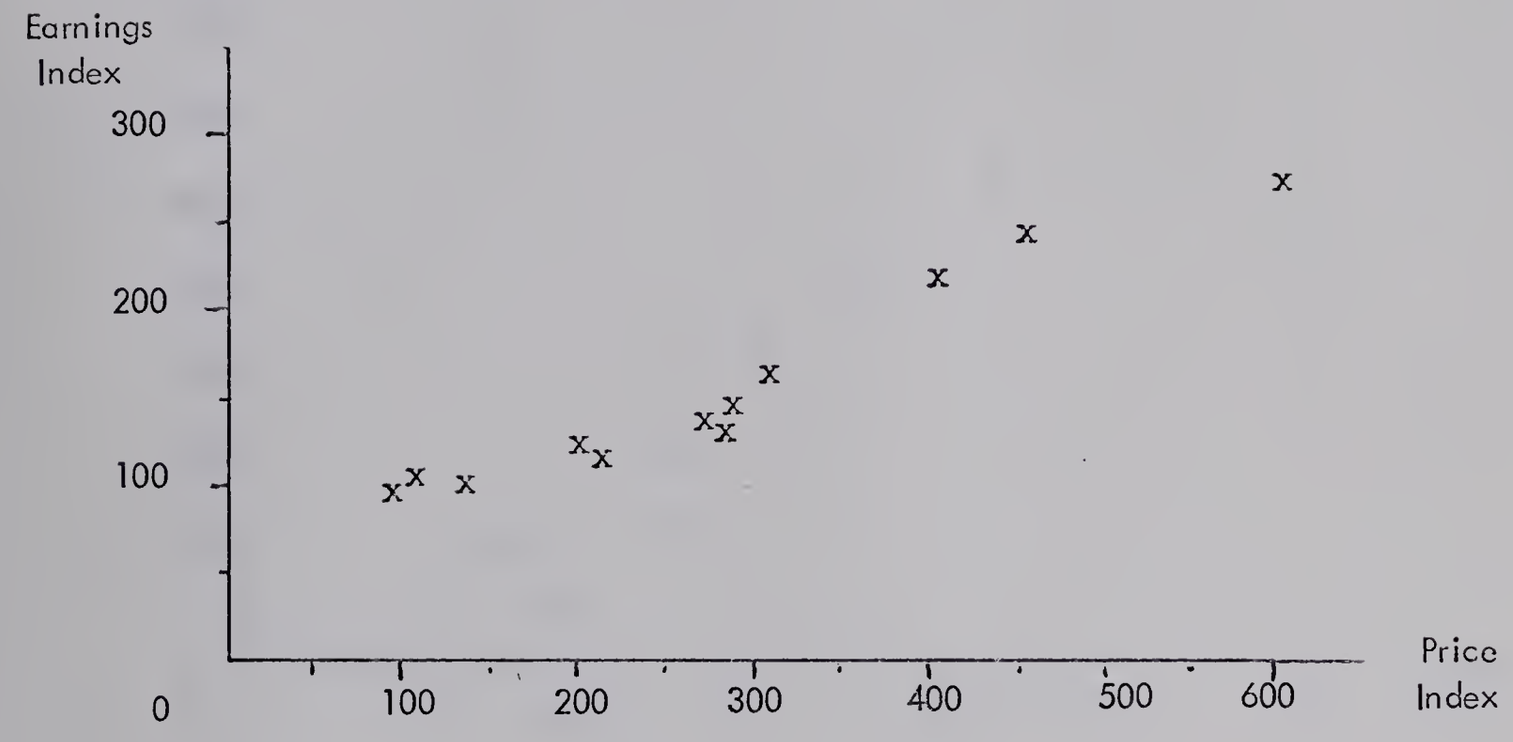
* Adjusted for autocorrelation

APPENDIX C

TEST FOR LINEARITY

FIGURE 1

TEST FOR LINEARITY
PRINTING AND PUBLISHING INDUSTRY



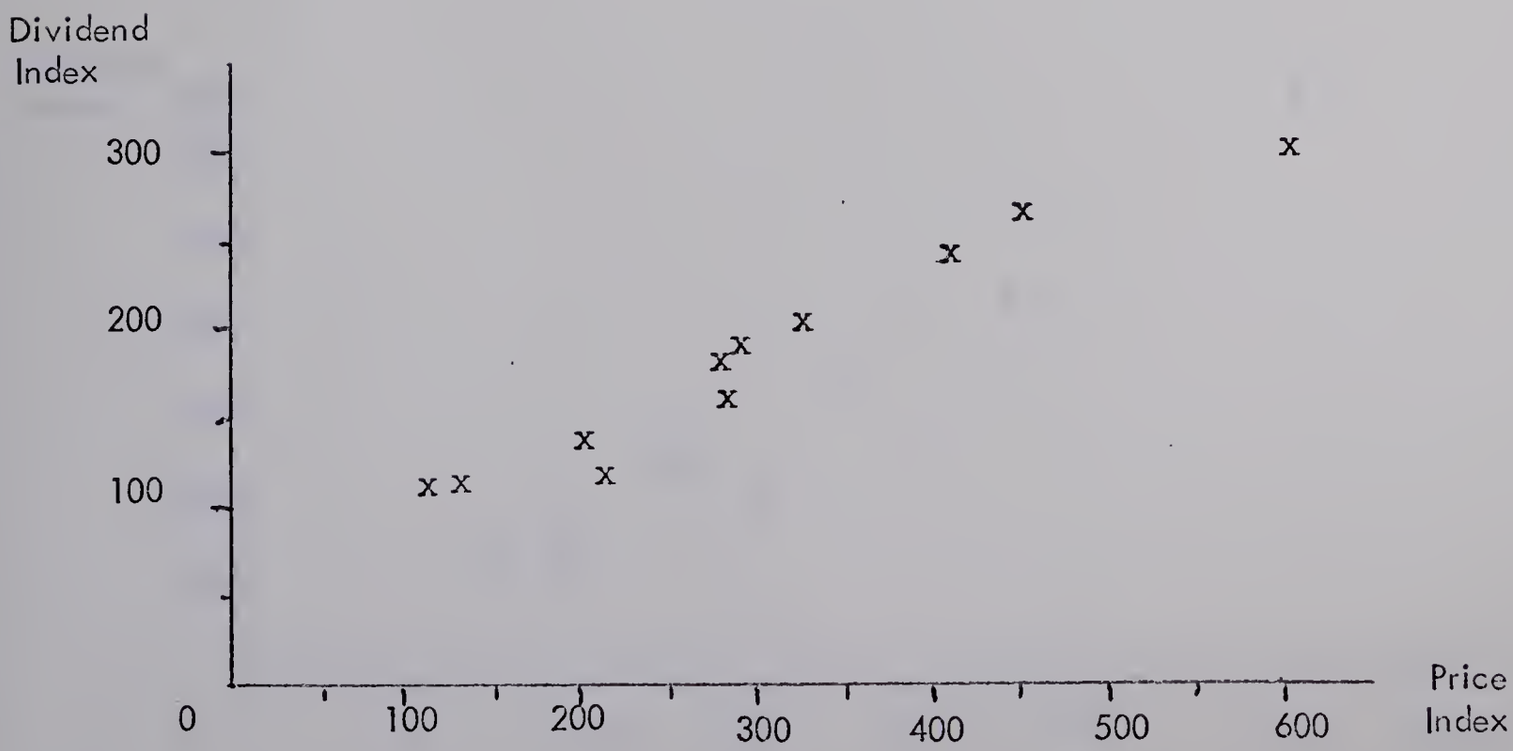
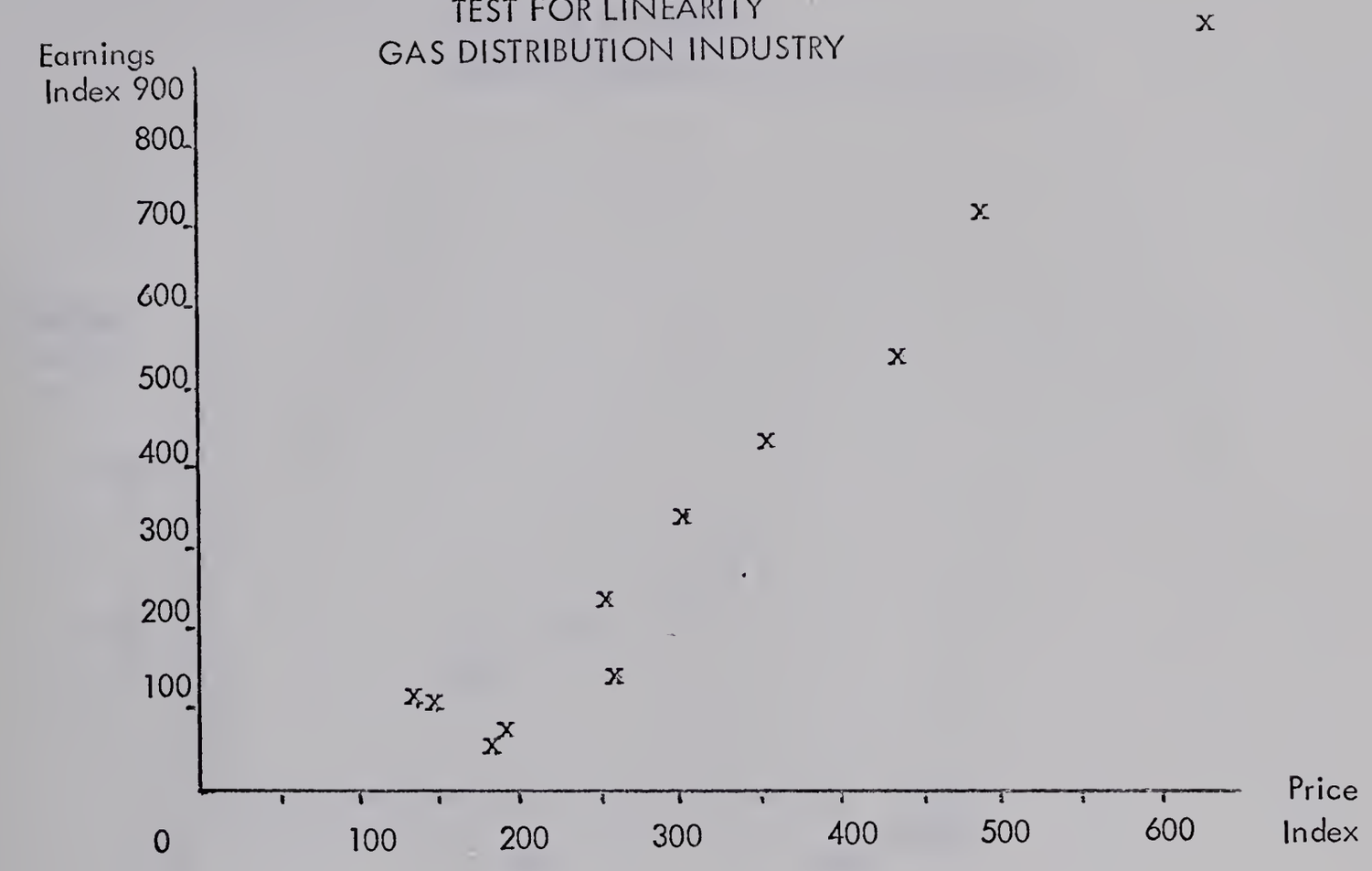


FIGURE 2

TEST FOR LINEARITY
GAS DISTRIBUTION INDUSTRY



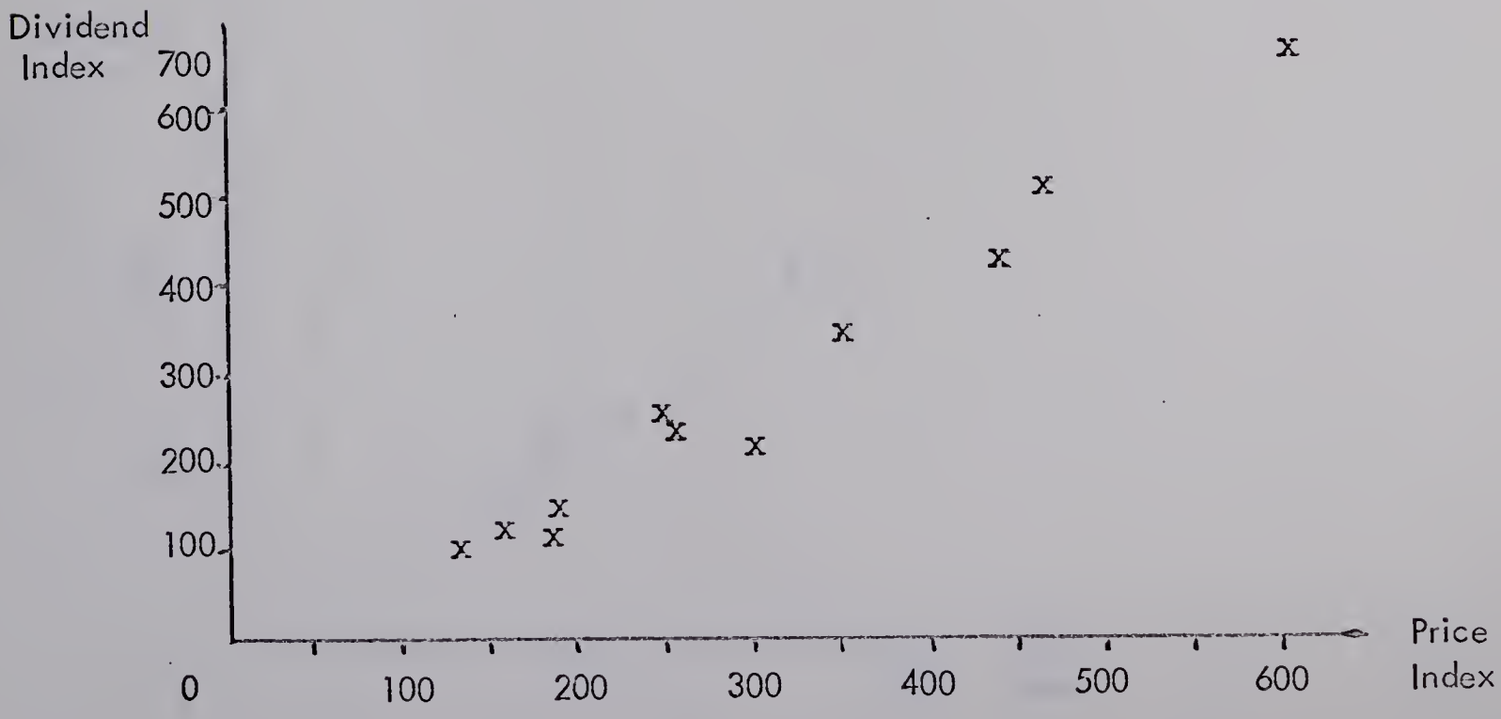
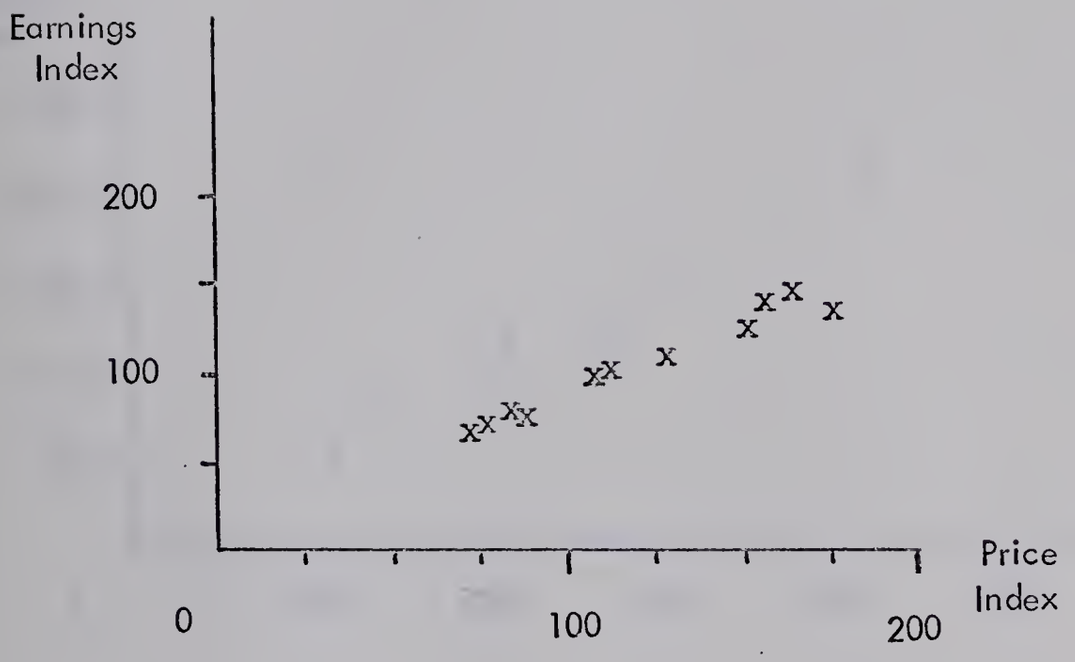


FIGURE 3

TEST FOR LINEARITY
UTILITIES (transformed for autocorrelation)



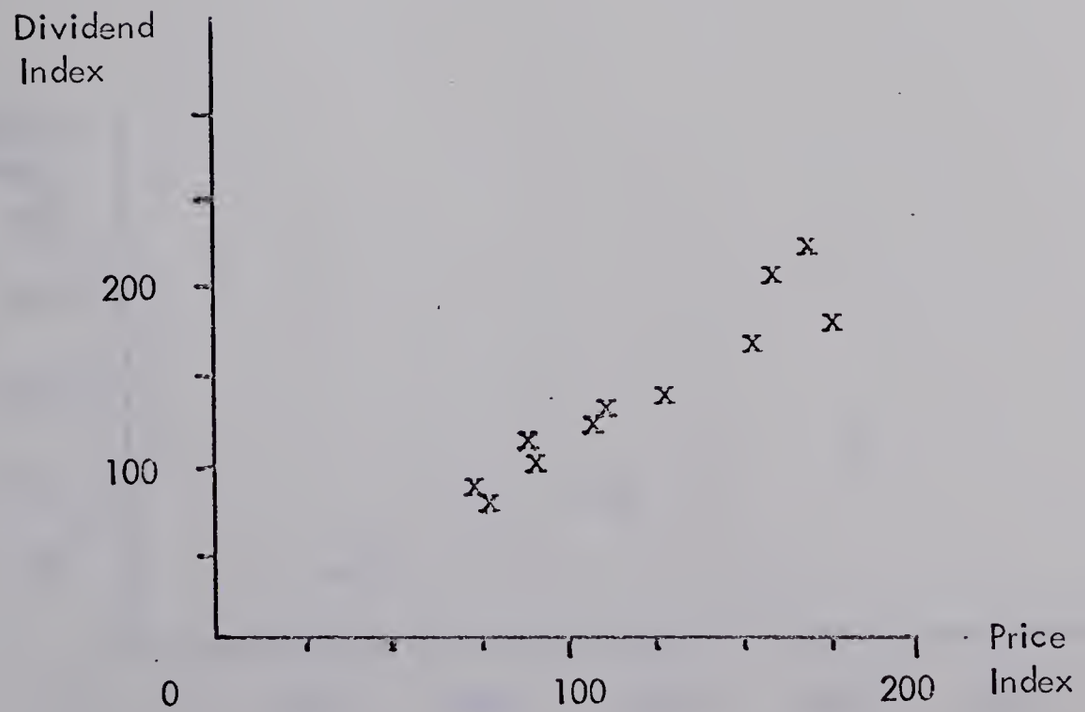
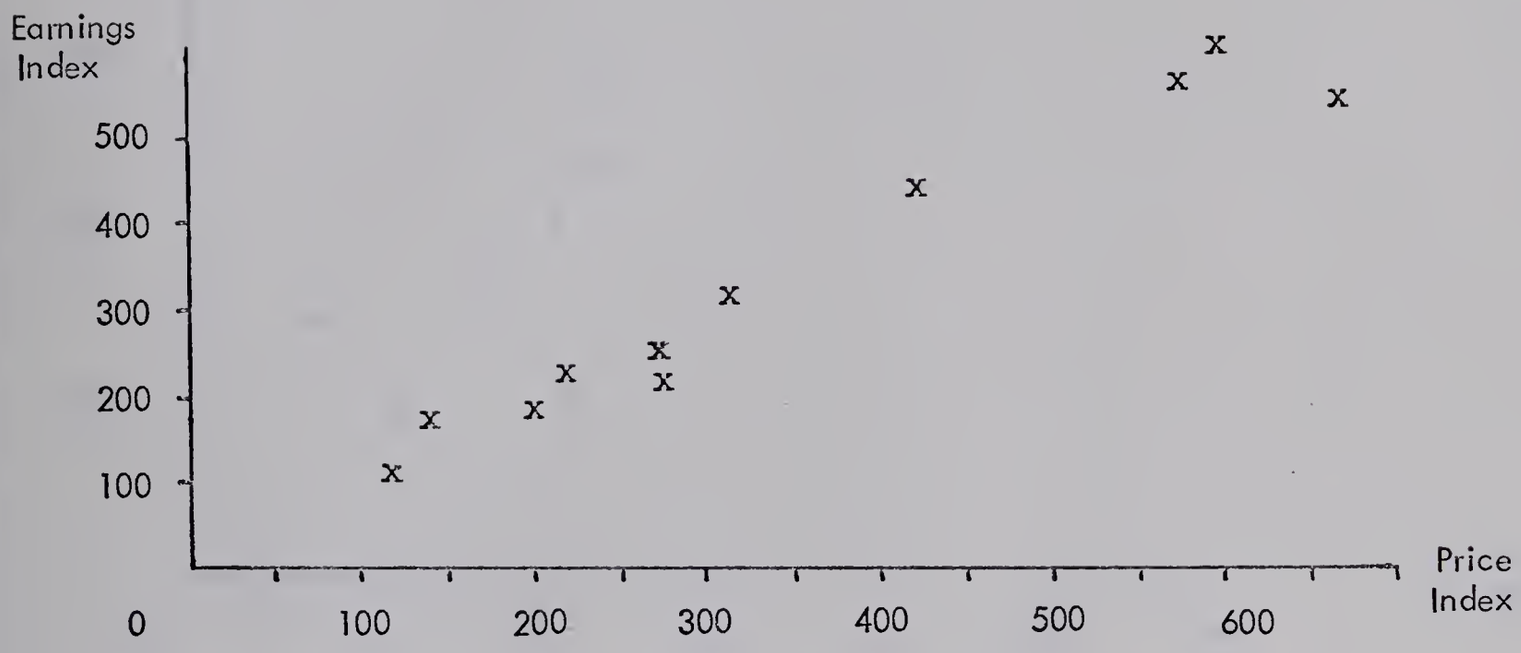


FIGURE 4

TEST FOR LINEARITY
GROWTH FIRMS



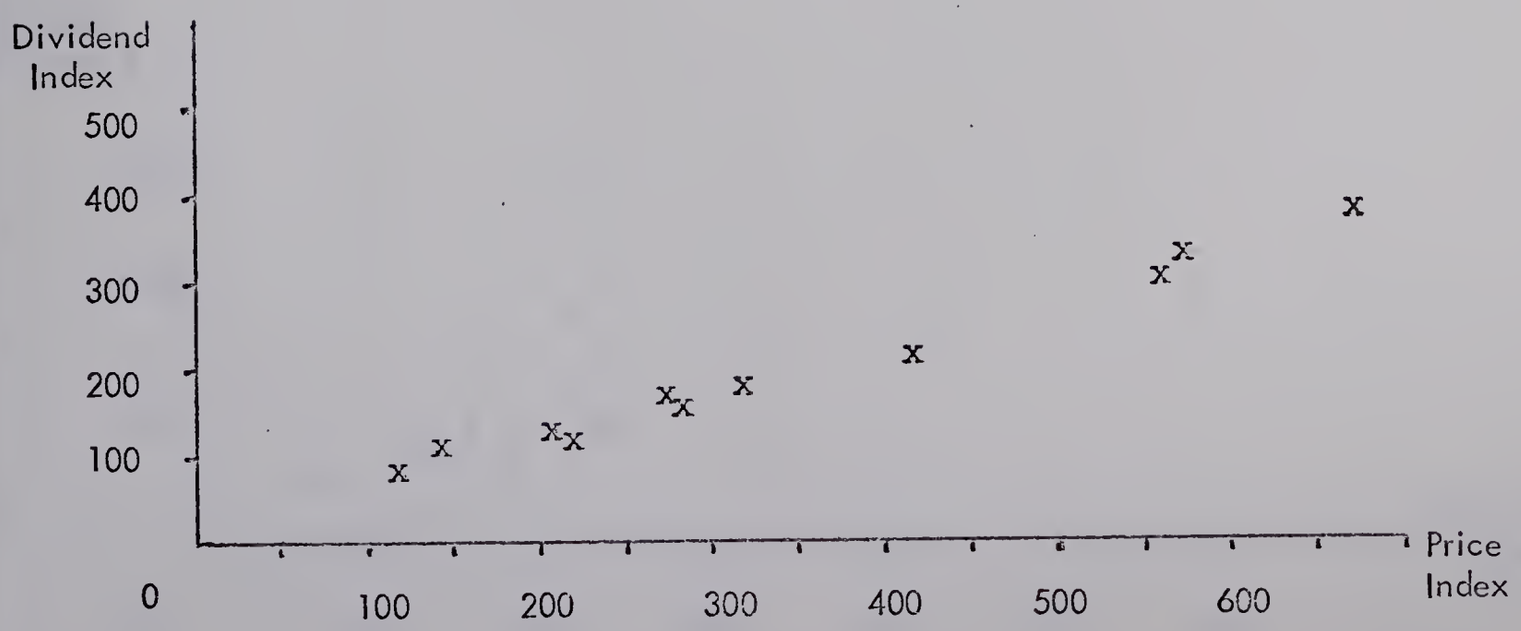
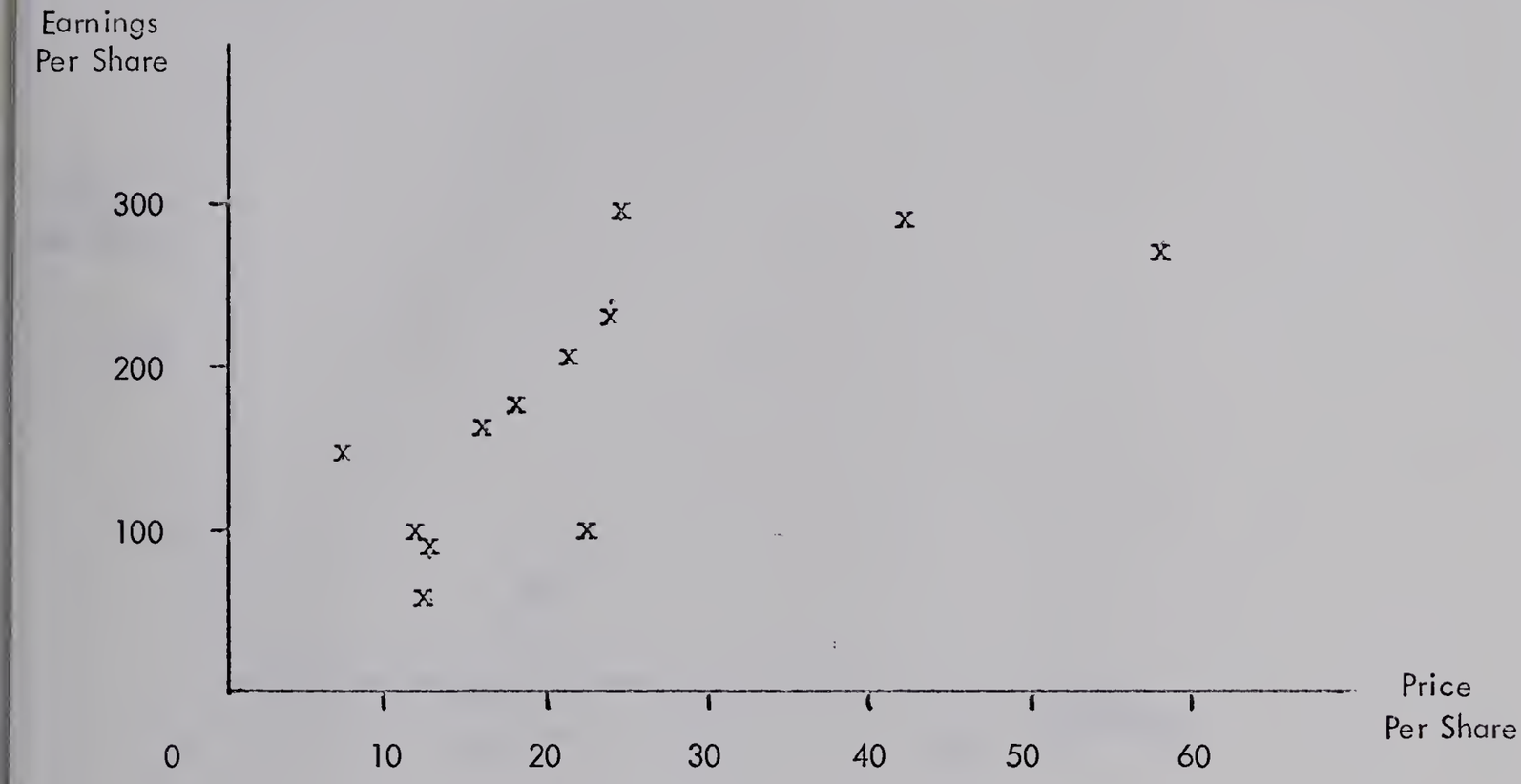


FIGURE 5

TEST FOR LINEARITY IN THE CROSS-SECTION MODEL
GROWTH FIRMS (1964)



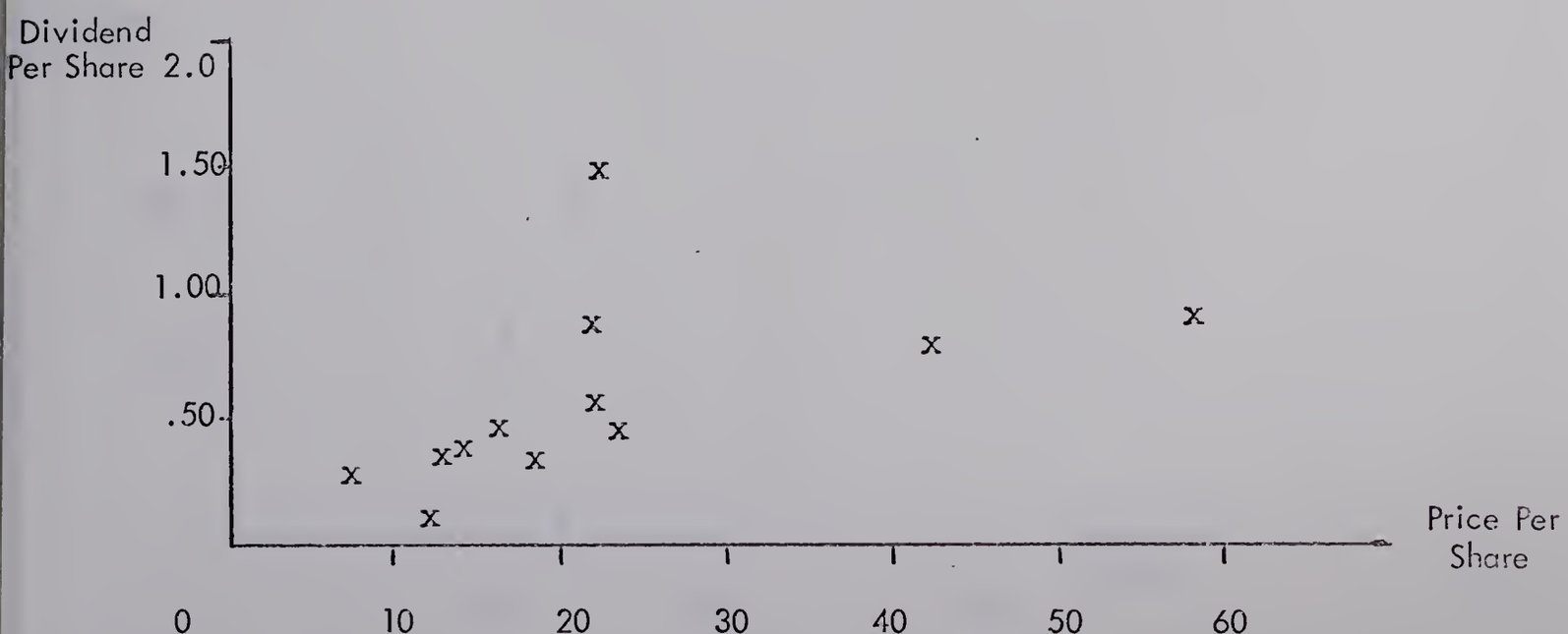
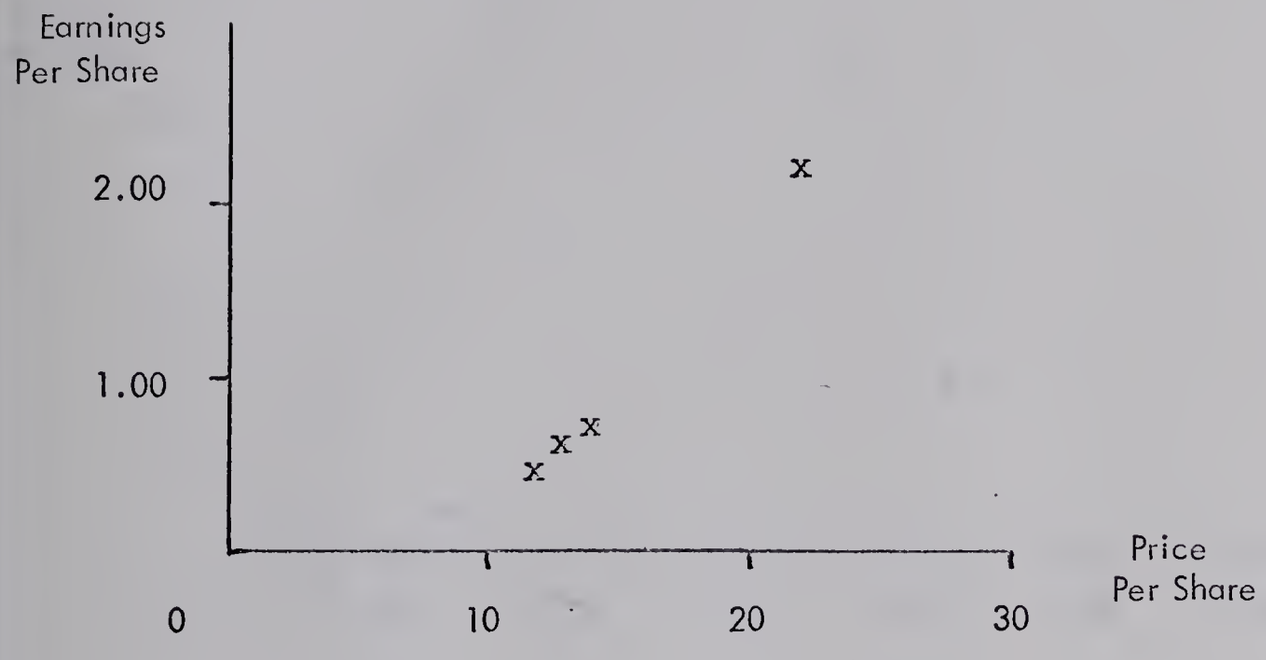


FIGURE 6

TEST FOR LINEARITY IN THE CROSS-SECTION MODEL
GAS DISTRIBUTION INDUSTRY (1966)



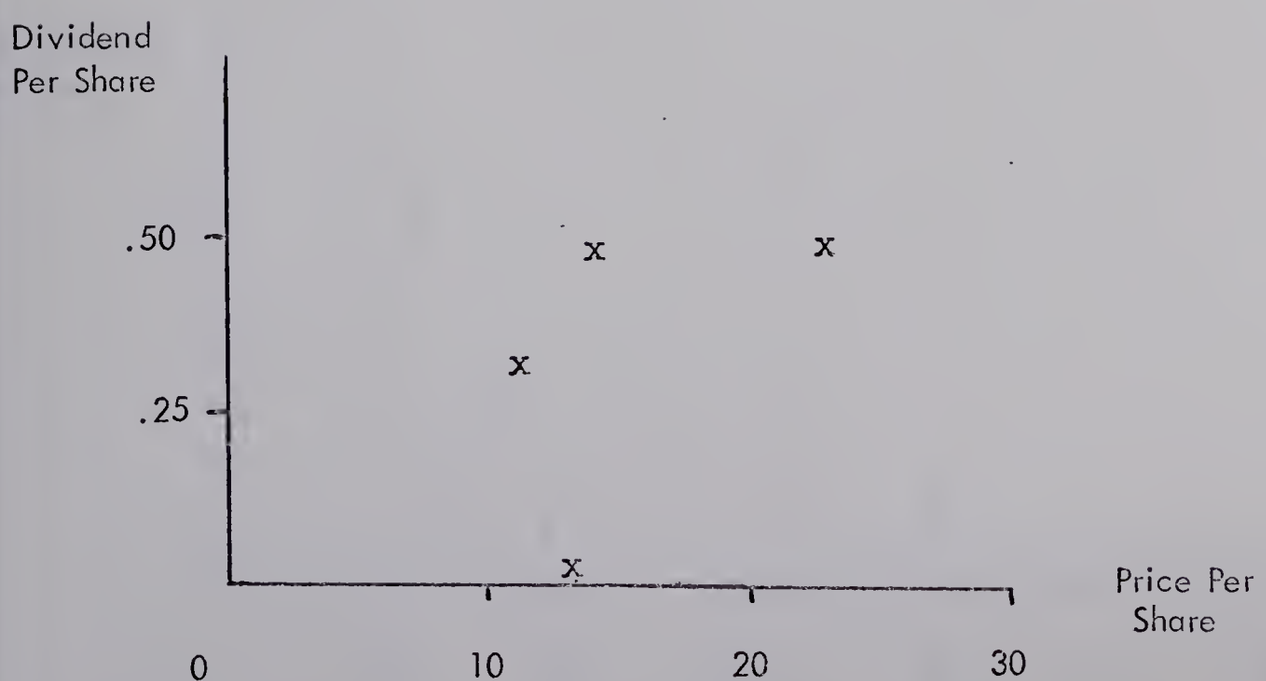
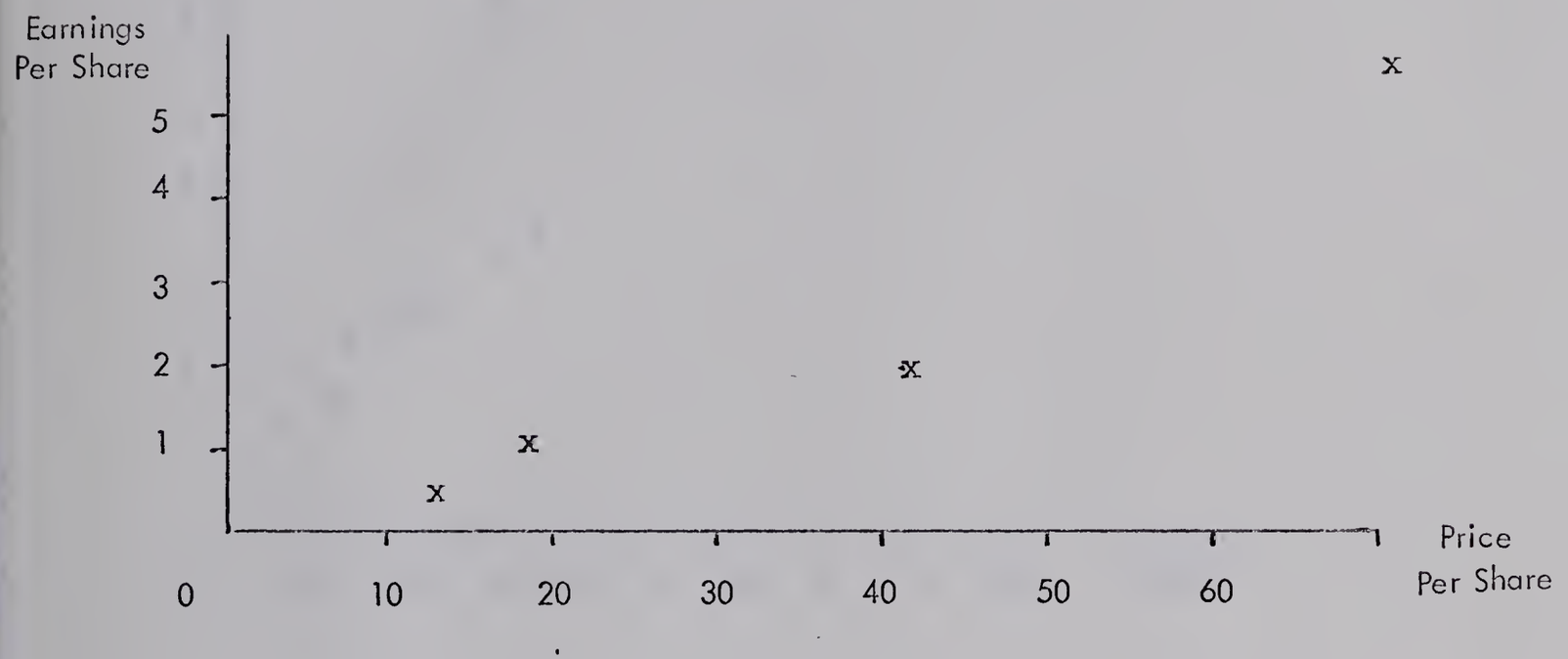


FIGURE 7

TEST FOR LINEARITY IN THE CROSS-SECTION MODEL
PRINTING AND PUBLISHING INDUSTRY (1959)



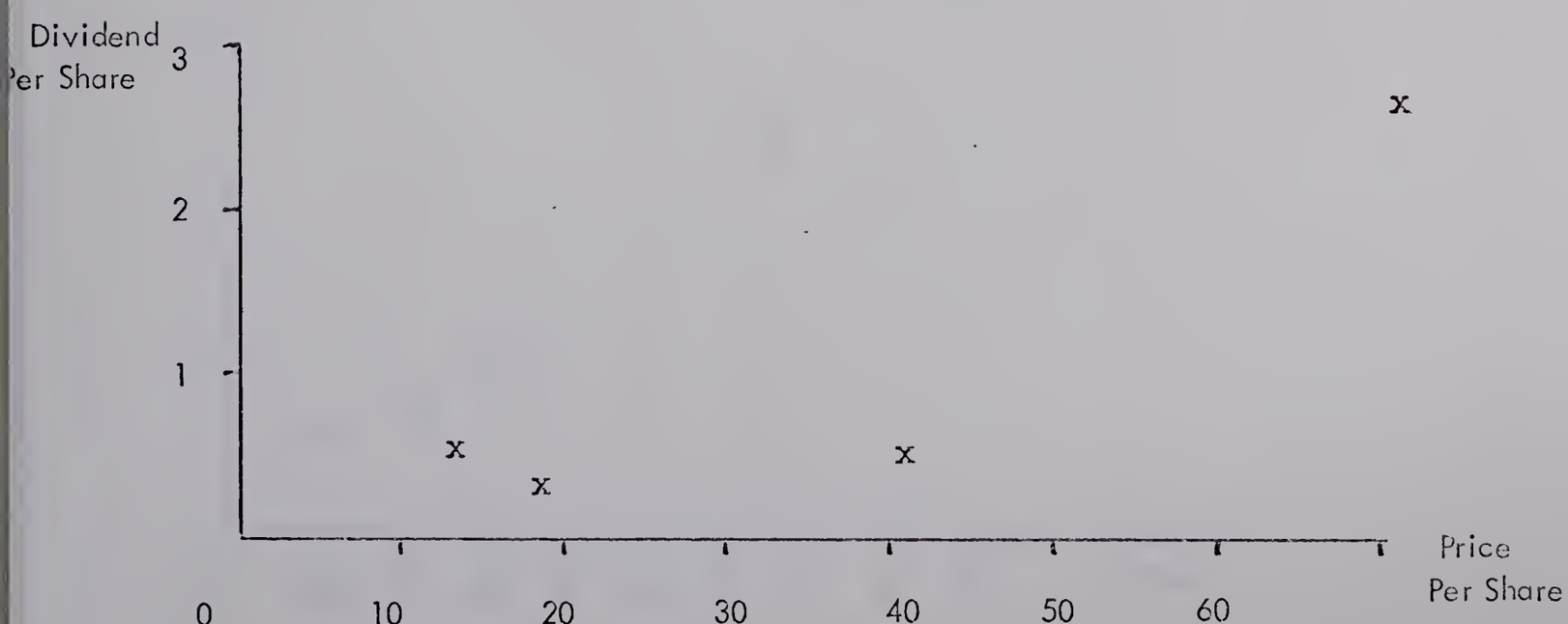


FIGURE 8

TEST FOR LINEARITY IN THE CROSS-SECTION MODEL
UTILITIES (1965)